

FAQ

Q How is sound measured in dB(A)?

A Decibels audible – dB(A) – measures sound power. It doesn't have any units, but equals the logarithm of the difference between a measured sound and a reference.

For dB(A), the reference is the smallest audible sound (near total silence), referred to as 0dB(A). Other positive dB(A) values indicate the increase of power from this reference value and follow a logarithmic, rather than linear, scale. So, 10dB(A) is 10 times more powerful than 0dB(A), but 20dB(A) is 100 times more powerful than 0dB(A) and 30dB(A) is 1,000 times more powerful than 0dB(A). This mimics the perceived volume of the sound, because the human ear gets less sensitive as sounds get louder.

To all intents and purposes, though, a sound measured at 20dB(A) or lower is silent, while sounds up to 30dB(A) are very quiet. To give you an idea, breathing is 10dB(A), a typical conversation is 60dB(A) and a baby crying is 110dB(A).

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Silence your PC

If your PC is giving you a headache, Chris Finnamore can show you how to silence your system and restore tranquillity

Your PC might be powerful and able to cope with hardcore video encoding or the latest 3D games, but we'll bet it doesn't do so quietly. There are three reasons why your PC is noisy: fans, other mechanical components and vibrations. Fans are probably the biggest offender and cause two types of noise: the buzz, hum or whine caused by the motor spinning the fan blades, and the hissing sound of air being moved. It's not a problem that's easily solved, as fans are essential to keep a PC running cool.

Mechanical components such as the hard disk or optical drive can also be responsible for a high level of noise. Unless you read or write a lot of discs, optical drives aren't such a big problem as they are noisy only when accessing a disc. Hard disks are in constant use, though, clicking and whirring as the platters spin and the actuator moves the read/write heads. Finally, the movement of fans and mechanical components causes vibrations. Depending on the construction of your case, these vibrations can be a source of serious noise and it's this problem that often makes a PC sitting on the floor seem louder in the room below.

GETTING STARTED

Before you start fixing the problem, there are some general things to check to make sure your PC isn't unnecessarily running its fans at the fastest speed. First, check for automatic fan speed control in your PC's BIOS. This uses the motherboard's temperature sensors to automatically adjust the speed of the processor fans and system fans. Turning on fan control will slow down the fan when the processor is idle, but speed up the fan to deal with heat when the processor is under load.

Modern AMD and Intel processors take this a step further with AMD's Cool 'n' Quiet and Intel's SpeedStep technology. When either of these functions is enabled in the BIOS, the motherboard will reduce the processor's

voltage and clock multiplier when the system is idle, so it requires less power and produces less heat. The option to enable either technology will probably be in the Power Management menu.

Finally, install SpeedFan (www.almico.com/speedfan.php). This free software monitors your PC's temperature sensors and fan speeds so you can see exactly what's going on. You can also use it to adjust fan speeds dynamically based on system temperature. This is a very useful feature, as the fan speed controls in some motherboard BIOSes don't adjust system fan speeds according to the temperature, as the manufacturer hasn't provided the necessary circuitry.

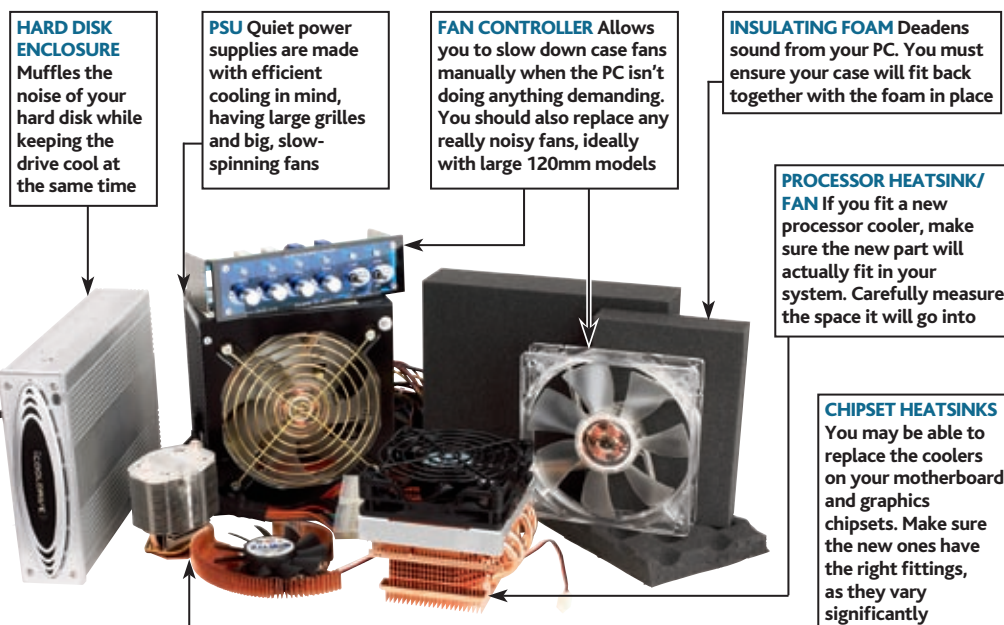
Before you start work on your PC, it's worth noting your current readings as a reference. As a general rule, system temperatures on a standard PC should be between 36°C and 52°C, although 38°C is ideal. The processor temperature will depend on your type of processor: Pentium 4 processors can run at a maximum of 70°C to 100°C, Athlon 64s between 70°C and 95°C, and Core 2 Duos between 35°C and 65°C. It's best to keep processors operating as far below the maximum as you can manage, though.

THE CASE

Your case is a large factor in how noisy your PC is. Cheap cases may have thin walls, can be poorly built and often have a weak supporting structure. This means that noise isn't contained inside the case, while vibrations can cause irritating sounds. Ideally, you should think about upgrading your case. Get one with thick walls, possibly with two layers. A steel structure will help prevent vibration noises, as will bracing struts.

If you want to stick with your existing case, there are a few ways to make it quieter. First, make sure the sides are fitted correctly and screwed tightly into place to prevent vibration. Next, if you've got your PC on a

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hard surface, you may find that vibrations from the components are being transmitted through this surface. Anti-vibration rubber feet should help. These are self-adhesive, so you just need to stick one to each of the four corners of your PC's underside.

To prevent sound escaping through thin walls, you can fit your case with sound-deadening material. To fit the sheets, take the sides and, if possible, the top and front off your case. Taking each panel in turn, lay the foam on the panel and use a sharp knife to cut the foam to size. Remove any fan shrouds first. To make a cut-out for a shroud, poke cocktail sticks through its screwholes to mark their positions. Lay the tube on top of the foam, with its screwholes on the marks. Cut around the tube and remove the foam within. Lay the foam on the panel and screw the tube back into place in the cut-out. Peel the tape from the foam to expose its adhesive and stick it to the inside of the panel.

The material shouldn't touch any circuit boards, so make sure you use the right thickness of foam to avoid contact with the motherboard. Fill any spare drive bays with the appropriate 3½in or 5¼in foam blocks. If you buy a kit without the drive-bay blocks, you can just cut the dampening material to a drive bay's size and stack it with multiple pieces until the bay is full.

If your power supply is loud, replace it with a model that produces a maximum of 24dB(A) under full load. We don't recommend trying to replace a power supply's fans, as this can be a dangerous thing to attempt.



CASE FANS

Fans are the biggest noise generators in a modern PC. First, look at how many fans you've got in your case. An average PC with a single hard disk should be fine with a single case fan at the rear; more powerful PCs with high-end graphics and multiple hard disks should be fine with a couple of fans. If you have more case fans than you think you need, try unplugging some of them. Monitor your system temperature to make sure it doesn't rise too much.

For the fans that you have to keep, try replacing them with silent or very quiet models. A fan with a rated sound of 28dB(A) is quiet, but ideally you need a fan of 20dB(A) or less. Also consider a fan's air-moving capacity in cubic feet per minute (cfm); the higher the rating, the more air a fan can move and the cooler your PC will be. There's generally a trade-off between performance and noise, though. A silent 80mm 15dB(A) fan spins slowly and can move only around 16cfm of air, while a quiet 80mm 28dB(A) fan spins faster but can move around 32cfm of air. Owners of expensive, high-end computers should choose the louder fans that

can move more air; owners of less-powerful computers should go for the quietest fans.

Try to buy fans with three-pin motherboard power connectors. These take power from your motherboard and let your PC monitor and control fan speed. Molex power connectors should be used only when you've run out of three-pin connectors on your motherboard.

A good way to cut down on noise is to use 120mm fans instead of 80mm fans. These can move more air at lower fan speeds; a near-silent 19dB(A) 120mm fan can move around 37cfm of air. If your case doesn't have mountings for 120mm fans, you can buy a fan adaptor. This is a funnel that attaches to an 80mm mount and takes a 120mm fan. If you don't have room inside your case for the adaptor and fan, you can screw the adaptor to the outside of the case, although you may need to remove a blanking plate to run the power cable.

To prevent noise from case vibration, use rubber fan mounts or gaskets. Fan mounts replace screws, but gaskets are the best choice as they form a seal between the case and the fan to cut down on whistling air, while the rubber absorbs vibration. Make sure the gasket and fan are screwed securely into place.

Finally, if you want fine control over your fans, invest in a fan-speed controller. This lets you slow down your fans, making them even quieter. The cheapest models let you control a single fan and plug into a blanking plate at the rear of the PC. Scythe's Kama-Meter fits in a 5¼in drive bay and lets you control up to four fans, displaying each fan's current speed and your system temperature. Use this temperature display to adjust the fans to their optimum position. You can also use SpeedFan to adjust a fan's speed while keeping your system temperature at a stable level.



COOLERS

The stock processor coolers can generate a lot of noise and should be replaced. A passive cooler with no fan is ideal, but you'll typically need a 120mm case fan to draw air out of the case. They often take up a lot of room, so make sure you have enough space first. Finally, check the cooler's specifications carefully, as many of them support only low-speed processors.

A traditional heatsink and fan is best for most PCs. Before you buy, check a fan's specifications carefully. A fan has a dB(A) range, which states how loud the fan is at minimum and maximum speeds. A quiet top speed is particularly important if you run a lot of processor-intensive tasks. Measure your case to make sure you've got the height, width and depth to fit your chosen

SHOPPING LIST

(All prices include VAT. Products are available from www.quietpc.com.)

Case accessories

Acousti AcoustiFeet soft black anti-vibration feet	£3
Acousti AcoustiPack Deluxe 2 Acoustic Material Kit	£34

Fans and fan accessories

Scythe Kama-Meter Multi-Functional Controller	£40
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Processor coolers

Zalman CNPS9500-AT Intel LGA775	£37
Zalman CNPS9500-AM2 AMD	£37

Motherboard

Zalman ZM-NBF47 Northbridge 'flower' heatsink	£10
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Graphics card

Zalman VF900-CU Quiet Dual Heatpipe VGA Cooler	£29
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Drive accessories

Scythe Quiet Drive Internal HDD Silencer	£30
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product. Before you fit your new cooler, apply new thermal paste, which will help keep your processor cool and reduce the cooler's fan speed.

Some motherboards also have noisy Northbridge fans that should be replaced. Zalman's ZM-NBF47 is a good choice. If your current cooler is attached with plastic studs, you'll have to remove the motherboard first to get the old cooler off. Apply new thermal paste and clip the new cooler into place. If your old cooler is attached with hooks, you don't need to remove the motherboard, but we advise removing any nearby components, such as the graphics card to give you space to work. Unhook the hooks, add new thermal paste and hook the new cooler into the correct position.

If you have a noisy graphics card, Zalman's VF900-CU should work with most graphics cards with stud connectors, bar the Nvidia 8800 range. To fit it, take out your current graphics card and unclip the studs. Apply new thermal paste and plug in the new cooler. Don't forget to attach the power cable.

HARD DISKS AND OPTICAL DRIVES

To make a hard disk quieter, you need a hard disk case. Scythe's Quiet Drive fits in a 5¼in drive bay and houses a single hard disk. It should block most of a hard disk's mechanical noise. Hard disks and optical drives are also guilty of vibrating a case and causing sound that way. You can cut this sound by buying stabilisation kits, which suspend the drive on rubber mounts to absorb vibration. These are easy to fit, and replace traditional screws. 



Next month

BUILD YOUR OWN EXTERNAL STORAGE
Tired of slow USB hard disks? We'll show you how to build fast eSata drives